Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402-2801

November 16, 2015

Mr. Barry Stephens, P.E. Director
Division of Air Pollution Control
Tennessee Department of Environment
and Conservation
Tennessee Tower William R. Snodgrass Building
312 Rosa L Parks Avenue, 15th Floor
Nashville, Tennessee 37243

Dear Mr. Stephens:

TENNESSEE VALLEY AUTHORITY (TVA) – NORTON HILL MICROWAVE STATION - OPERATING PERMIT APPLICATION FOR AN EMERGENCY GENERATOR, START-UP CERTIFICATION

Please find enclosed the referenced operating permit application. This application is to operate one new 36 hp diesel-powered emergency generator at TVA's Norton Hill Microwave Station. Also, enclosed is a copy of the source's construction permit, which contains the signed start-up certification.

If you have any questions or comments concerning this correspondence, please contact Jack Byars at (423) 751-2666 in Chattanooga, Tennessee.

Sincerely,

Billy R. Hall, Jr
General Manager
Telecom and Control Systems

Enclosures

OPERATING PERMIT APPLICATION FOR DIESEL ENGINE EMERGENCY GENERATOR AT NORTON HILL MICROWAVE STATION

JACKSON, TENNESSEE

NOVEMBER 2015

State of Tennessee
Department of Environment and Conservation
Division of Air Pollution Control
William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, TN 37243
Telephone: (615) 532-0554

APC 100

NON-TITLE V PERMIT APPLICATION
FACILITY IDENTIFICATION

Please type or print and submit in duplicate for each emission source. Attach appropriate source description forms.

SITE INFORMATION

1. Organization's legal name Tennessee Valley Authority (TVA) - Norton Hill Microwave Station		For APC use only	APC Company point no. 57-0404-02
2. Site name (if different from legal name)			APC Log/Permit no. 071038P
3. Site address (St./Rd./Hwy.) Hwy 45 South			County name Madison
City or distance to nearest town Jackson, TN	Zip code 38305		**4.** NAICS or SIC code 4911
5. Site location (in lat. /long.)	Latitude 35.531		Longitude -88.777

CONTACT INFORMATION (RESPONSIBLE PERSON)

6. Responsible person/Authorized contact Billy R. Hall, Jr.			Phone number with area code 423-751-6963
Mailing address (St./Rd./Hwy.) 1101 Market Street, SP 4H-C			Fax number with area code
City Chattanooga	State TN	Zip code 37402	Email address brhall1@tva.gov

CONTACT INFORMATION (TECHNICAL)

7. Principal technical contact Shannon L. Burks			Phone number with area code 256-275-5953
Mailing address (St./Rd./Hwy.) 1010 Reservation Road			Fax number with area code
City Muscles Shoals	State AL	Zip code 35661	Email address slburks@tva.gov

CONTACT INFORMATION (BILLING)

8. Billing contact Jack G. Byars			Phone number with area code 423-751-2666
Mailing address (St./Rd./Hwy.) 1101 Market Street, BR 4A - C			Fax number with area code 423-751-7011
City Chattanooga	State TN	Zip code 37402	Email address jgbyars@tva.gov

EMISSION SOURCE INFORMATION

9. Emission source no. (number which uniquely identifies this source)
DG-1

10. Brief description of emission source
36 hp diesel engine for emergency generator. Cummins Generator Model C20 D6. Kubota Engine Model V2203M. 2015 Model Year.

11. Normal operation:	Hours/Day 8.33	Days/Week	Weeks/Year	Days/Year 12
12. Percent annual throughput	Dec. – Feb. 25%	March – May 25%	June – August 25%	Sept. – Nov. 25%

(Over)

TYPE OF PERMIT REQUESTED

13. Operating permit (X)	Date construction started	Date completed	Last permit no.	Emission source reference number
	Oct. 19, 2015	Oct. 22, 2015	970681P	57-0404-02
Construction permit ( )	Last permit no.		Emission source reference number	

If you choose Construction permit, then choose either New Construction, Modification, or Location transfer

	New Construction ( )	Starting date	Completion date
	Modification ( )	Date modification started or will start	Date completed or will complete
	Location transfer ( )	Transfer date	Address of last location

14. Describe changes that have been made to this equipment or operation since the last construction or operating permit application:

N/A

SIGNATURE

Based upon information and belief formed after a reasonable inquiry, I, as the responsible person of the above mentioned facility, certify that the information contained in this application and any attached application(s) is accurate and true to the best of my knowledge. As specified in TCA Section 39-16-702(a)(4), this declaration is made under penalty of perjury.

15. **Signature** (application must be signed before it will be processed)		**Date** 11/16/2015
Signer's name (type of print)	**Title**	**Phone number with area code**
Billy R. Hall, Jr.	General Manager, Telecom	423-751-6963

Table of Pollution Reduction Device or Method Codes

Note: For cyclones, settling chambers, wet scrubbers, and electrostatic precipitators; the efficiency ranges correspond to the following percentages:
High: 95-99+%. Medium: 80-95% And Low: Less than 80%.
If the system has several pieces of connected control equipment, indicate the sequence. For example: 008'010.97%
If none of the below codes fit, use 999 as a code for other and specify in the comments.

No Equipment	000
Activated Carbon Adsorption	048
Afterburner – Direct Flame	021
Afterburner – Direct Flame with Heat Exchanger	022
Afterburner – Catalytic	019
Afterburner – Catalytic with Heat Exchanger	020
Alkalized Alumina	040
Catalytic Oxidation – Flue Gas Desulfurization	039
Cyclone – High Efficiency	007
Cyclone – Medium Efficiency	008
Cyclone – Low Efficiency	009
Dust Suppression by Chemical Stabilizers or Wetting Agents	062
Electrostatic Precipitator – High Efficiency	010
Electrostatic Precipitator – Medium Efficiency	011
Electrostatic Precipitator – Low Efficiency	012
Fabric Filter – High Temperature	016
Fabric Filter – Medium Temperature	017
Fabric Filter – Low Temperature	018
Fabric Filter – Metal Screens (Cotton Gins)	059
Flaring	023
Gas Adsorption Column -- Packed	050
Gas Adsorption Column – Tray Type	051
Gas Scrubber (General: Not Classified)	013
Limestone Injection – Dry	041
Limestone Injection – Wet	042
Liquid Filtration System	049
Mist Eliminator – High Velocity	014
Mist Eliminator – Low Velocity	015
Process Change	046
Process Enclosed	054
Process Gas Recovery	060
Settling Chamber – High Efficiency	004
Settling Chamber – Medium Efficiency	005
Settling Chamber – Low Efficiency	006
Spray Tower (Gaseous Control Only)	052
Sulfuric Acid Plant – Contact Process	043
Sulfuric Acid Plant – Double Contact Process	044
Sulfur Plant	045
Vapor Recovery System (Including Condensers, Hooding and Other Enclosures)	047
Venturi Scrubber (Gaseous Control Only)	053
Wet Scrubber – High Efficiency	001
Wet Scrubber – Medium Efficiency	002
Wet Scrubber – Low Efficiency	003
Wet Suppression by Water Sprays	061

Table of Emission Estimation Method Codes

Not application / Emissions are known to be zero	0
Emissions based on source testing	1
Emissions based on material balance using engineering expertise and knowledge of process	2
Emissions calculated using emission factors from EPA publications No. AP-42 Compilation of Air Pollution Emissions Factors	3
Judgment	4
Emissions calculated using a special emission factor different from that in AP-42	5
Other (Specify in comments)	6

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NON-TITLE V PERMIT APPLICATION
PROCESS OR FUEL BURNING SOURCE DESCRIPTION

Please type or print and submit in duplicate and attach to the Non-Title V Facility Identification Form (APC 100).

GENERAL IDENTIFICATION AND DESCRIPTION

1. Organization name	For APC use only	APC Company – Point no.
Tennessee Valley Authority (TVA) - Norton Hill Microwave Station		
2. Emission source no. (As on Non-Title V Facility Identification Form)		APC Log/Permit no.
DG-1		

3. Description of process unit

36 hp diesel engine for emergency generator. Cummins Gen. Model C20 D6. Kubota Engine Model V2203M. 2015 Model Year.

PROCESS SOURCE DESCRIPTION AND DATA

4. Type of source	(Check only one option below)
Process Source: Apply for a separate Permit for each source. (Check at right and complete lines 5, 6, and 11)	( )
Process Source with in process fuel: Products of combustion contact materials heated. Apply for a separate permit for each source. (Check at right and complete lines 5, 6, and 8 through 11)	( )
Non-Process fuel burning source: Products of combustion do not contact materials heated. Complete this form for each boiler or fuel burner and complete a Non-Title V Emission Point Description Form (APC 101) for each stack. (Check at right and complete lines 7 to 11)	(X)

5. Type of operation: Continuous ( ) Batch ( )	Normal batch time	Normal batches/day

6. Process material inputs and In-process solid fuels	Diagram reference	Input rates (pounds/hour) Design	Actual
A.			
B.			
C.			
D.			
E.			
F.			
G.			
Totals			

*** A simple process flow diagram must be attached.**

(Over)

BOILER, BURNER, GENERATOR, OR SIMILAR FUEL BURNING PROCESS DESCRIPTION

7. Boiler or burner data: (Complete lines 7 to 11 using a separate form for each boiler, burner, etc.)

Number	Stack number**	Type of firing***	Rated horsepower	Rated input capacity (10^6 BTU/Hr.)	Other rating (specify capacity and units)
	DG-1	Internal Combustion	36	0.266	

Serial no.	Date constructed	Date manufactured	Date of last modification (explain in comments below)
H150865347	September 2015	August 2015	

** Source with a common stack will have the same stack number.
*** Cyclone, spreader (with or without reinjection), pulverized (wet or dry bottom, with or without reinjection), other stoker (specify type, hand fired, automatic, or other type (describe below in comments).

FUEL USED IN BOILER, BURNER, GENERATOR, OR SIMILAR FUEL BURNING SOURCE

8. Fuel data: (Complete for a process source with in process fuel or a non-process fuel burning source)

Primary fuel type (specify): No. 2 Fuel Oil

Standby fuel type(s) (specify):

Fuels used	Annual usage	Hourly usage		% Sulfur	% Ash	BTU value of fuel		(For APC use only) SCC code
		Design	Average					
Natural gas:	10^6 Cu. Ft.	Cu. Ft.	Cu. Ft.	/ / / / / / / /	/ / / /	1,000		
#2 Fuel oil:	10^3 Gal. 0.19	Gal. 1.9	Gal. 1.9	0.0015	/ / / /	140,000		
#5 Fuel oil:	10^3 Gal.	Gal.	Gal.		/ / / /			
#6 Fuel oil:	10^3 Gal.	Gal.	Gal.		/ / / /			
Coal:	Tons	Lbs.	Lbs.					
Wood:	Tons	Lbs.	Lbs.	/ / / / / / / /	/ / / /			
Liquid propane:	10^3 Gal.	Gal.	Gal.	/ / / / / / / /	/ / / /	85,000		
Other (specify type & units):								

9. If Wood is used as a fuel, specify types and estimate percent by weight of bark

10. If Wood is used with other fuels, specify percent by weight of wood charged to the burner.

11. Comments

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NON-TITLE V PERMIT APPLICATION
EMISSION POINT DESCRIPTION

Please type or print and submit in duplicate for each stack or emission source. Attach to the Non-Title V Facility Identification Form (APC 100).

GENERAL IDENTIFICATION AND DESCRIPTION

1. Organization name	For APC use only	APC Company point no.
Tennessee Valley Authority (TVA) - Norton Hill Microwave Station		

2. Emission source no. (As on Non-Title V Facility Identification Form)	Flow diagram point number	APC Log/Permit no.
DG-1	N/A	

3. Brief emission point description (Attach a sketch if appropriate):	Distance to nearest property line (Ft.)
36 hp diesel engine for emergency generator. Kubota Engine Model V2203M. 2015 Model Yr.	N/A

STACK AND EMISSION DATA

4. Stack or emission point data: →	Height above grade (Ft.)	Diameter (Ft.)	Temperature (°F)	% of time over 125°F	Direction of exit (Up, down or horizontal)
	4	0.167	970		

Data at exit conditions: →	Flow (actual $Ft.^3/Min.$)	Velocity (Ft./Sec.)	Moisture ($Grains/Ft.^3$)	Moisture (Percent)
	174	133		

Data at standard conditions: →	Flow (Dry std. $Ft.^3/Min.$)	Velocity (Ft./Sec.)	Moisture ($Grains/Ft.^3$)	Moisture (Percent)

5. Air contaminants	Actual emissions						
	Emissions (Lbs./Hr.)						
	Average	Maximum	Concentration	Avg. emissions (Tons/Yr.)	Emissions est. method code	Control devices *	Control efficiency%
Particulate matter	0.0175	0.0175	**	8.73E-04	5	000	0
Sulfur dioxide (SO_2)	4.03E-04	4.03E-04	***	2.01E-05	3	000	0
Carbon monoxide (CO)	0.325	0.325	PPM	0.0163	5	000	0
Organic compounds			PPM				
Nitrogen oxides (NOx) + Nonmethane Hydrocarbons	0.444	0.444	PPM	0.0222	5	000	0
Fluorides							
Greenhouse gases (CO_2 equivalents)	43.5	43.5		2.18	5	000	0
Hazardous air pollutant (specify)							
Hazardous air pollutant (specify)							
Other (specify)							
Other (specify)							
Other (specify)							

(Over)

6. Check types of monitoring and recording instruments that are attached: Opacity monitor ( ), SO_2 monitor ( ), NO_X monitor ( ), Other (specify in comments) ( ) N/A	
7. Comments Annual emissions based on 100 hours per year operation.	
8. Control device or Method code description:	Description of operating parameters of device (flow rate, temperature, pressure drop, etc.): 000

* Refer to the tables below for estimation method and control device codes.

** Exit gas particulate matter concentration units: Process – Grains/Dry Standard Ft^3 (70^0F), Wood fired boilers - Grains/Dry Standard Ft^3 (70^0F), all other boilers – Lbs. /Million BTU heat input.

*** Exit gas sulfur dioxide concentrations units: Process – PPM by volume, dry bases, and boilers – Lbs. /Million BTU heat input

Table of Pollution Reduction Device or Method Codes
(Alphabetical listing)

Note: For cyclones, settling chambers, wet scrubbers, and electrostatic precipitators; the efficiency ranges correspond to the following percentages:
High: 95-99+%. Medium: 80-95% And Low: Less than 80%.
If the system has several pieces of connected control equipment, indicate the sequence. For example: 008'010.97%
If none of the below codes fit, use 999 as a code for other and specify in the comments.

No Equipment 000
Activated Carbon Adsorption 048
Afterburner – Direct Flame 021
Afterburner – Direct Flame with Heat Exchanger 022
Afterburner – Catalytic 019
Afterburner – Catalytic with Heat Exchanger 020
Alkalized Alumina 040
Catalytic Oxidation – Flue Gas Desulfurization 039
Cyclone – High Efficiency 007
Cyclone – Medium Efficiency 008
Cyclone – Low Efficiency 009
Dust Suppression by Chemical Stabilizers or Wetting Agents 062
Electrostatic Precipitator – High Efficiency 010
Electrostatic Precipitator – Medium Efficiency 011
Electrostatic Precipitator – Low Efficiency 012
Fabric Filter – High Temperature 016
Fabric Filter – Medium Temperature 017
Fabric Filter – Low Temperature 018
Fabric Filter – Metal Screens (Cotton Gins) 059
Flaring 023
Gas Adsorption Column -- Packed 050
Gas Adsorption Column – Tray Type 051
Gas Scrubber (General: Not Classified) 013
Limestone Injection – Dry 041
Limestone Injection – Wet 042
Liquid Filtration System 049
Mist Eliminator – High Velocity 014
Mist Eliminator – Low Velocity 015
Process Change 046
Process Enclosed 054
Process Gas Recovery 060
Settling Chamber – High Efficiency 004
Settling Chamber – Medium Efficiency 005
Settling Chamber – Low Efficiency 006
Spray Tower (Gaseous Control Only) 052
Sulfuric Acid Plant – Contact Process 043
Sulfuric Acid Plant – Double Contact Process 044
Sulfur Plant 045
Vapor Recovery System (Including Condensers, Hooding and Other Enclosures) 047
Venturi Scrubber (Gaseous Control Only) 053
Wet Scrubber – High Efficiency 001
Wet Scrubber – Medium Efficiency 002
Wet Scrubber – Low Efficiency 003
Wet Suppression by Water Sprays 061

Table of Emission Estimation Method Codes

Not application / Emissions are known to be zero 0
Emissions based on source testing 1
Emissions based on material balance using engineering expertise and knowledge of process 2
Emissions calculated using emission factors from EPA publications No. AP-42 Compilation of Air Pollution Emissions Factors 3
Judgment 4
Emissions calculated using a special emission factor different from that in AP-42 5
Other (Specify in comments) 6

Table 1. Small Emergency Generator Diesel Engine at Norton Hill Microwave Station in Jackson, Tennessee

Emission Source			36 hp Diesel Engine	
Engine Horsepower Rating, hp			36	
Year Installed			2015	
Diesel Fuel Use, gal/hr			1.9	
Diesel Fuel Heat Content, Btu/gal			140,000	
Diesel Engine Heat Input Rating, MMBtu/hr			0.266	
Annual Hours of Operation, hr [1]			100	
	EPA	AP-42		
	Emission Limit [2]	Emission Factor	Emissions	
	g/hp-hr	lb/MMBtu	lb/hr	ton/yr at 100 hr/yr
Filterable Particulate Matter (PM)	0.22		0.0175	0.000873
Nitrogen Oxides (NOx) + Nonmethane Hydrocarbons (NMHC)	5.60		0.444	0.0222
Carbon Monoxide (CO)	4.10		0.325	0.0163
Sulfur Dioxide (SO_2) [3]		0.00152	4.03E-04	2.01E-05
Antimony (Sb) [4]		2.20E-05	5.85E-06	2.93E-07
Arsenic (As) [5]		1.10E-05	2.93E-06	1.46E-07
Beryllium (Be) [5]		3.10E-07	8.25E-08	4.12E-09
Cadmium (Cd) [5]		4.80E-06	1.28E-06	6.38E-08
Hydrogen Chloride (HCl) [6]		3.11E-04	8.27E-05	4.13E-06
Chromium (Cr) [5]		1.10E-05	2.93E-06	1.46E-07
Cobalt (Co) [4]		9.10E-06	2.42E-06	1.21E-07
Lead (Pb) [5]		1.40E-05	3.72E-06	1.86E-07
Manganese (Mn) [6]		1.01E-04	2.68E-05	1.34E-06
Mercury (Hg) [5]		1.20E-06	3.19E-07	1.60E-08
Nickel (Ni) [5]		4.60E-06	1.22E-06	6.12E-08
Selenium (Se) [5]		2.50E-05	6.65E-06	3.33E-07
Benzene [7]		9.33E-04	2.48E-04	1.24E-05
Toluene [7]		4.09E-04	1.09E-04	5.44E-06
Xylenes [7]		2.85E-04	7.58E-05	3.79E-06
1,3-Butadiene [7]		3.91E-05	1.04E-05	5.20E-07
Formaldehyde [7]		1.18E-03	3.14E-04	1.57E-05
Acetaldehyde [7]		7.67E-04	2.04E-04	1.02E-05
Acrolein [7]		9.25E-05	2.46E-05	1.23E-06
Total POMs [7]		1.68E-04	4.47E-05	2.23E-06
Organic HAP Total [7]		3.87E-03	1.03E-03	5.15E-05
Carbon Dioxide Equivalent [8]		163.6	43.5	2.18

1 Annual emissions based on 100 hours per year operation.

2 USEPA Emission Limits. 40 CFR Part 60 Subpart IIII.

3 Mass balance emission factor based on diesel fuel sulfur content of 15 ppm.

4 US EPA, Compilation of Air Pollutant Emission Factors (AP-42), 5th Edition, Supplement B, Section 3.1, 10/1996.

5 US EPA, Compilation of Air Pollutant Emission Factors (AP-42), 5th Edition, Supplement F, Section 3.1, 4/2000.

6 TVA combustion turbine fuel oil specifications.

7 AP-42, 5th edition, Section 3.3, 10/96.

8 CO_2 factor is 73.96 kg CO_2/MMBtu, CH_4 factor is 0.003 kg CH_4/MMBtu, N_2O factor is 0.0006 kg N_2O/MMBtu.
CO_2 equivalent factor for CO_2 is 1.0, CO_2 equivalent factor for CH_4 is 25, CO_2 equivalent factor for N_2O is 298.

Sample Calculations

Particulates: 0.22 g/hp-hr x 36 hp x lb/453.6 g = 0.0175 lb/hr
0.0175 lb/hr x 100 hr/yr x ton/2000 lb = 0.000873 ton/yr

Sulfur Dioxide: 15 ppm sulfur = 0.0015 %S
1.01 x 0.0015 lb/MMBtu x 0.266 MMBtu/hr = 0.000403 lb/hr
0.000403 lb/hr x 100 hr/yr x ton/2000 lb = 0.0000201 ton/yr

Power Generation

2015 EPA Tier 4i Exhaust Emission Compliance Statement C20 D6 Stationary Emergency

60 Hz Diesel Generator Set

Compliance Information:

The engine used in this generator set complies with U.S. EPA New Source Performance Standards for Stationary Emergency engine under the provisions of 40 CFR Part 60 Subpart IIII when tested per ISO 8178 D2.

Engine Manufacturer:	Kubota Corporation
EPA Certificate Number:	FKBXL02.2FCC-025
Effective Date:	01/09/2015
Date Issued:	01/09/2015
EPA Engine Family (Cummins Emissions Family):	FKBXL02.2FCC

Engine Information:

Model:	Kubota V2203M	Bore:	3.43 in. (87 mm)
Engine Nameplate HP:	36	Stroke:	3.64 in. (92 mm)
Type:	4 Cycle, In-line, 4 Cylinder Diesel	Displacement:	134.1 cu. In. (2 liters)
Aspiration:	Naturally aspirated	Compression Ratio:	22:1
Emission Control Device:		Exhaust Stack Diameter:	2 in.(51 mm)

Diesel Fuel Emission Limits

D2 Cycle Exhaust Emissions

	Grams per BHP-hr			Grams per kWm-hr		
	NOx + NMHC	CO	PM	NOx + NMHC	CO	PM
Cert Test Results - Diesel Fuel (300-4000 ppm Sulfur)	3.90	0.70	0.16	5.20	1.00	0.22
EPA Emissions Limit	5.60	4.10	0.22	7.50	5.50	0.30
Cert Test Results - CARB Diesel Fuel (<15 ppm Sulfur)	3.60	0.70	0.14	4.80	1.00	0.19
CARB Emissions Limit	5.60	4.10	0.22	7.50	5.50	0.30

Cert Test Results - The CARB emission values are based on CARB approved calculations for converting EPA (500 ppm) fuel to CARB (15 ppm) fuel.

Test Methods: EPA/CARB emissions recorded per 40CFR89 (ref. ISO8178-1) and weighted at load points prescribed in Subpart E, Appendix A for Constant Speed Engines (ref. ISO8178-4, D2)

Diesel Fuel Specifications: Cetane Number: 40-48. Reference: ASTM D975 No. 2-D.

Reference Conditions: Air Inlet Temperature: 25°C (77°F), Fuel Inlet Temperature: 40°C (104°F). Barometric Pressure: 100 kPa (29.53 in Hg), Humidity: 10.7 g/kg (75 grains H2O/lb) of dry air; required for NOx correction, Restrictions: Intake Restriction set to a maximum allowable limit for clean filter; Exhaust Back Pressure set to a maximum allowable limit.

Tests conducted using alternate test methods, instrumentation, fuel or reference conditions can yield different results.
Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emission levels.